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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/691,083	10/18/00	BODEN	M IR1444 DIV.

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EXAMINER

KEBEDE, B

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 08/15/01

Pleas find below and/or attached an Office communication concerning this application or
pr ce ding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/691,083

Applicant(s)

BODEN ET AL.

Examiner

Brook Kebede

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

a. The attempt to incorporate subject matter into this application by reference to Hohl et al. "Simulating Single-Event Burnout in Vertical Power MOSFETs," IEEE Trans Electron Devices, vol. 40 pp. 1001-1008, 1993 is improper because applicants did not submit the reference in conjunction with PTO-1449 form. Appropriate correction is required.

b. The attempt to incorporate subject matter into this application by reference to U.S. Patent No. 4,593,302; 5,338,693 and 5,475,252 is improper because applicants did not submit the references in conjunction with PTO-1449 form. Appropriate correction is required.

c. The specification recites "boron implant dose of 5E15" in page 6, line 1, "phosphorous implant dose of about 7.0E13" in page 6, line 12, "dose of about 3.0E15" in page 9, line 15, "dose of about 1E12" in page 9, line 22, "dose of roughly 5.5E13 to 8E13" in page 10, lines 18, "dose of approximately 3E15" in page 10, line 26, and "polysilicon is doped with about a 5E15" in page 12, line 6. However, these numbers will have no meaning because there is no quantitative unit is given in the specification. Appropriate correction is required.

Claim Objections

2. Claim 1 objected to because of the following informalities:

Claim 1 recites the limitation "said body region" in line 12. As suggestion, change "said body region" to --said N-type body regions-- in order to be consistent throughout the claim language. Appropriate correction is required.

Claim 1 recites the limitation “said source regions” in line 18. As suggestion, change “said source region” to --said P-type source region-- in order to be consistent throughout the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 4, 5 and 13 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for ion implantation such as boron and phosphorous , does not reasonably provide enablement for the claimed dopant concentration range. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to the concentration range of the invention commensurate in scope with these claims.

Claim 4 recites the limitation “phosphorous implant at dose of about 5.5E13” in line 4. Since there is no physical unit is presented to describe the concentration range of the claimed invention any where in the disclosure, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to the concentration range of the invention commensurate in scope with these claims.

Claim 5 recites the limitation “phosphorous implant at dose of about 8.0E13” in line 4. Since there is no physical unit is presented to describe the concentration range of the claimed invention any where in the disclosure, the specification does not enable any person skilled in the

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art to which it pertains, or with which it is most nearly connected, to the concentration range of the invention commensurate in scope with these claims.

Claim 13 recites the limitation "boron implant of about $5.5E13$ " in lines 3-4. Since there is no physical unit is presented to describe the concentration range of the claimed invention anywhere in the disclosure, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to the concentration range of the invention commensurate in scope with these claims.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "said first surface" in line 17. There is insufficient antecedent basis for this limitation in the claim.

Claim 7 recites the limitation "said base region" in lines 2, 4 and 5. There is insufficient antecedent basis for this limitation in the claim.

Claim 11 recites the limitation "said source electrode" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Williams (US/5,248,627).

Re claim 1, Williams discloses a MOS gated device which is resistant to single event radiation failure and having improved total dose radiation resistance; said device comprising: a P-type substrate (10 20) having substantially flat, parallel upper (20) and lower (10) surfaces; a plurality of laterally spaced N-type body regions (82 40) extending from said upper surface into said substrate (20); at least one respective P-type source region (84) formed in each of said body regions (82) in said upper surface of said substrate (20) and defining a respective channel region (40) in said upper surface in said body region ; a gate electrode (60) disposed atop and insulated from said channel region and operable to invert said channel region in response to the application of a suitable gate voltage to said gate electrode (60); and a source electrode (84) disposed atop said first surface (20) and connected to each of said source regions (82); said gate electrode being comprised of P-type polysilicon (see Figs. 6 and 7).

Re claim 2, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation said gate electrode (60) is insulated from said channel region (62) by a gate dielectric layer (50) comprised of silicon dioxide (see Figs. 6 and 7).

Re claim 3, as applied to claim 2 above, Williams discloses all the claimed limitations including the limitation wherein said gate dielectric has a thickness of between 500 to 1000 angstroms (see Col. 4, lines 38-43).

Re claim 4, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein each of said N-type channel regions has a doping

concentration corresponding to that of an approximately 100 KeV phosphorus implant at a dose of about 5.5×10^{13} atoms/cm³ (see Col. 4, lines 15-29).

Re claim 5, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein each of said N-type channel regions has a doping concentration corresponding to that of an approximately 100 KeV phosphorus implant at a dose of about 8.0×10^{13} atoms/cm³ (see Col. 4, lines 15-29).

Re claim 6, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein said substrate (10 20) includes a chip of monocrystalline silicon at said lower surface of said substrate and an epitaxial layer formed atop said chip and that is less heavily doped than said chip (see Figs. 6 and 7).

Re claim 7, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein said base region includes a portion adjacent to said upper surface that is more heavily doped than another portion of said base region that is adjacent to a lower boundary between said base region and said substrate (see Figs. 6 and 7).

Re claim 8, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation an interlayer dielectric layer formed atop said gate electrode and having openings therein in which said source electrode contacts said source regions (see Figs. 6 and 7).

Re claim 9, as applied to claim 8 above, Williams discloses all the claimed limitations including the limitation wherein said interlayer dielectric is low temperature oxide (see Figs. 6 and 7).

Re claim 10, as applied to claim 8 above, Williams discloses all the claimed limitations including the limitation wherein said interlayer dielectric includes dopant ions (see Figs. 6 and 7)

Re claim 11, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation a passivation layer formed atop said source electrode (see Figs. 6 and 7).

Re claim 12, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein said passivation layer is comprised of low temperature oxide (see Figs. 6 and 7).

Re claim 13, as applied to claim 1 above, Williams discloses all the claimed limitations including the limitation wherein said gate electrode has a doping concentration corresponding to that of an approximately 50 KeV boron implant of about 5×10^{15} atoms/cm³ (see Figs. 6 and 7).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure Enjoh (US/5,288,653), Williams et al. (US/5,451,533), Williams (US/5,465,000), Hshieh et al. (US/5,479,037), Yamamoto et al. (US/5,529,940), Hshieh et al. (US/5,729,037), Hshieh et al. (US/5,731,611), and Hshieh et al. (US/6,049,104) also can be use the reject the instant application.

Correspondent

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (703) 306-4511. The examiner can normally be reached on 8-5 Monday to Friday.

11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

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12. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Brook Kebede

BK
August 8, 2001

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